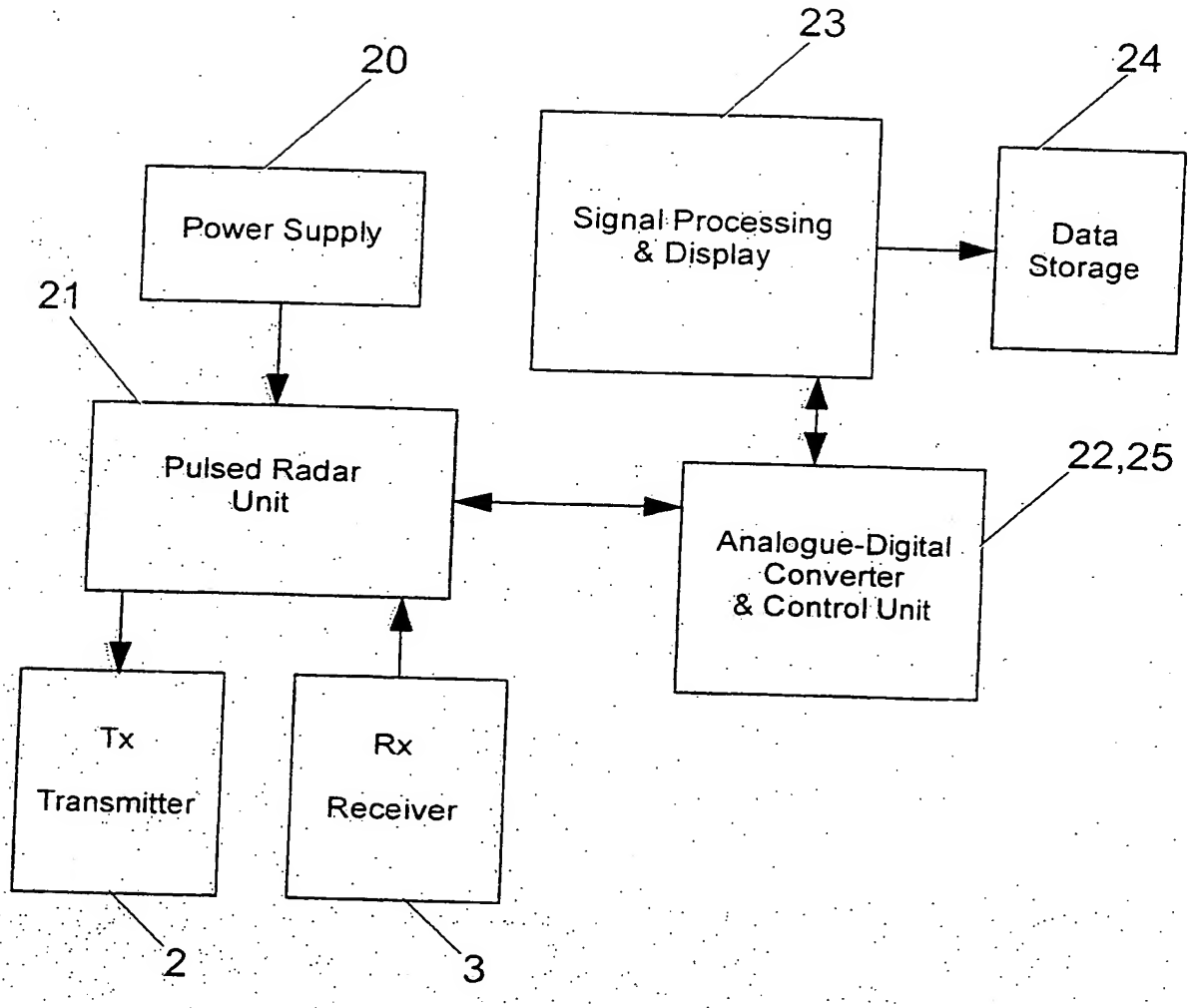

20
Power Supply
23
Signal Processing & Display
24
Data Storage
21
Pulsed Radar Unit
22,25
Analogue-Digital Converter & Control Unit
Tx
Transmitter
Rx
Receiver
2
3

Fig. 1

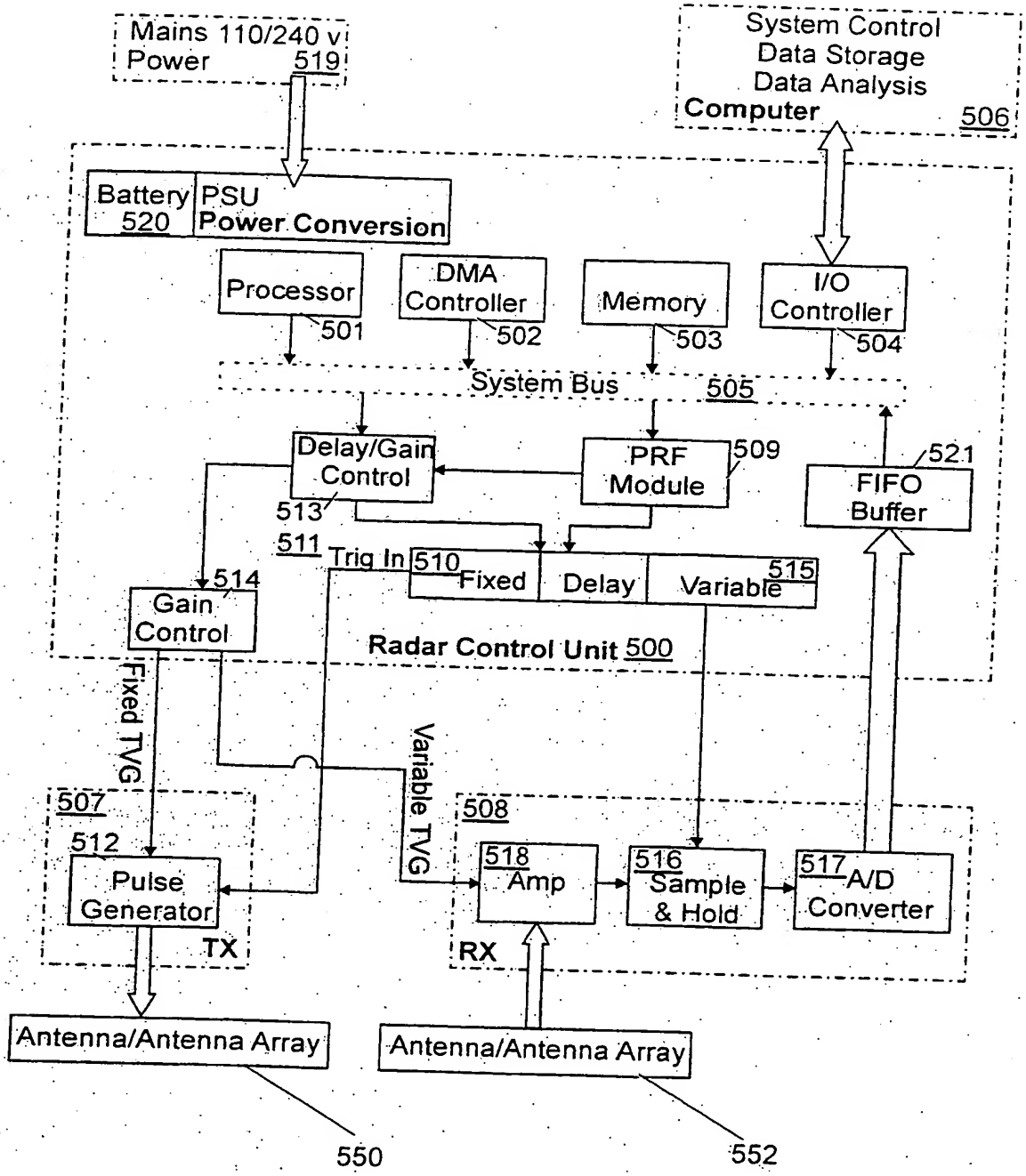

Mains 110/240 v
Power 519
System Control
Data Storage
Data Analysis
Computer 506
Battery 520
PSU
Power Conversion
Processor 501
DMA Controller 502
Memory 503
I/O Controller 504
System Bus 505
Delay/Gain Control 513
PRF Module 509
FIFO Buffer 521
511 Trig In
510 Fixed Delay Variable 515
Gain Control 514
Radar Control Unit 500
Fixed TVG
Variable TVG
507
512
Pulse Generator
TX
508
518 Amp
516 Sample & Hold
517 A/D Converter
RX
Antenna/Antenna Array
Antenna/Antenna Array
550
552

Fig. 2

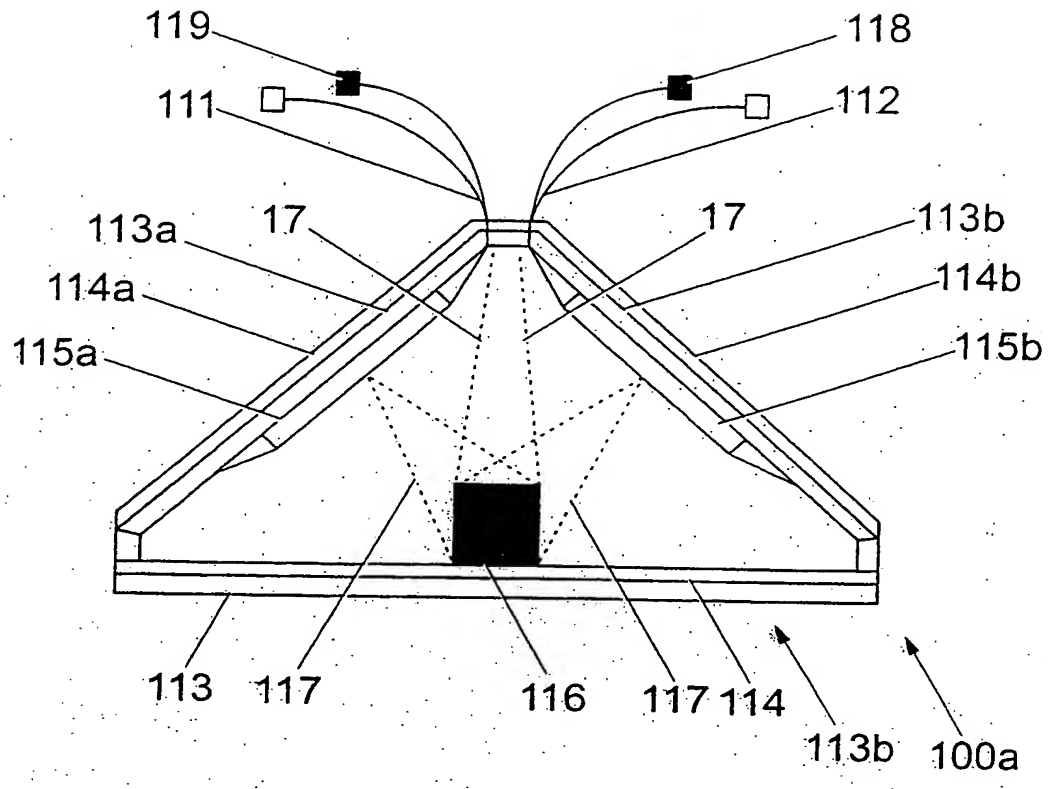

119
118
111
112
113a
17
17
113b
114a
114b
115a
115b
113
117
116
117
114
113b
100a

Fig. 3A

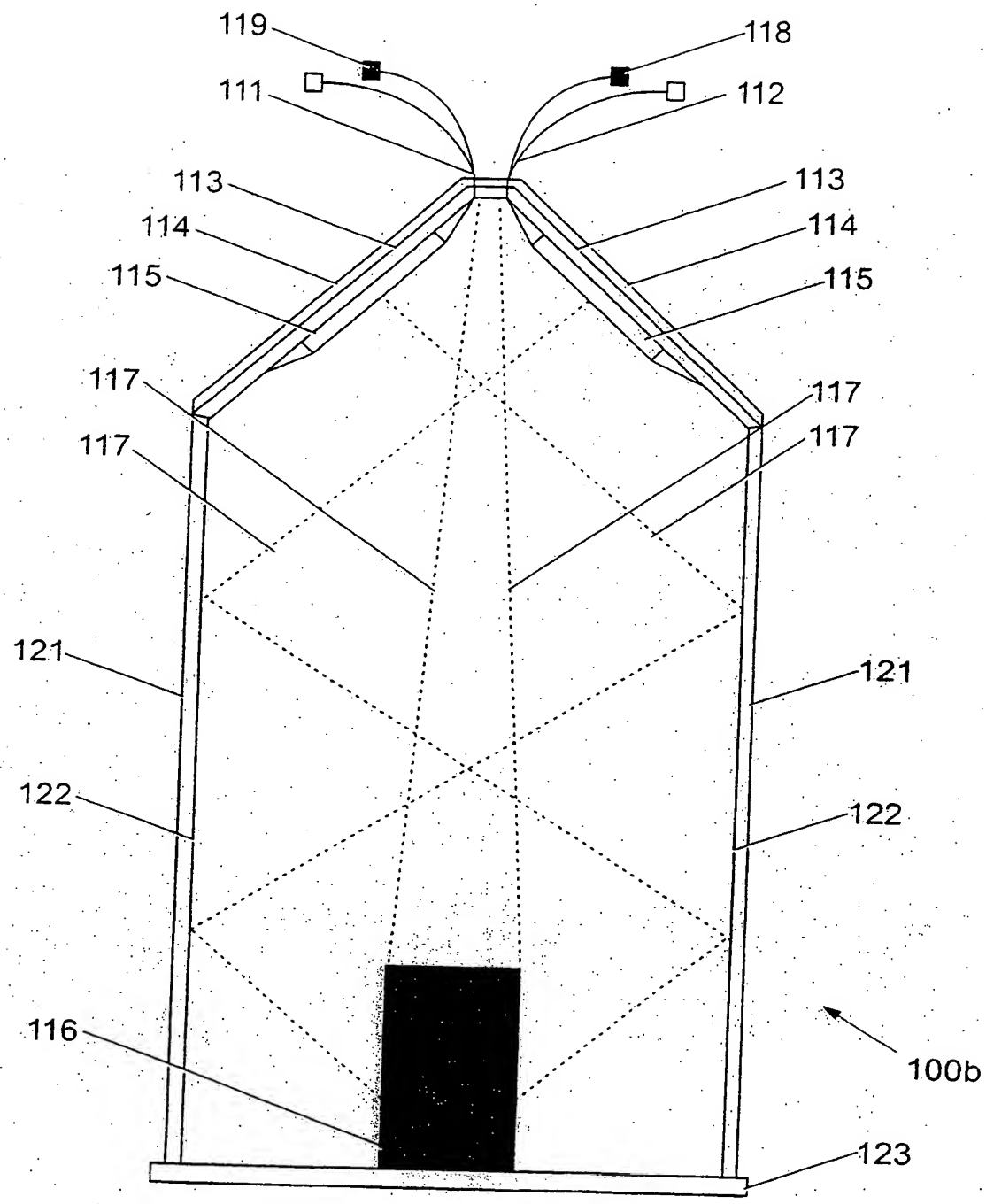

119
118
111
112
113
113
114
114
115
115
117
117
117
117
121
121
122
122
116
100b
123

Fig. 3B

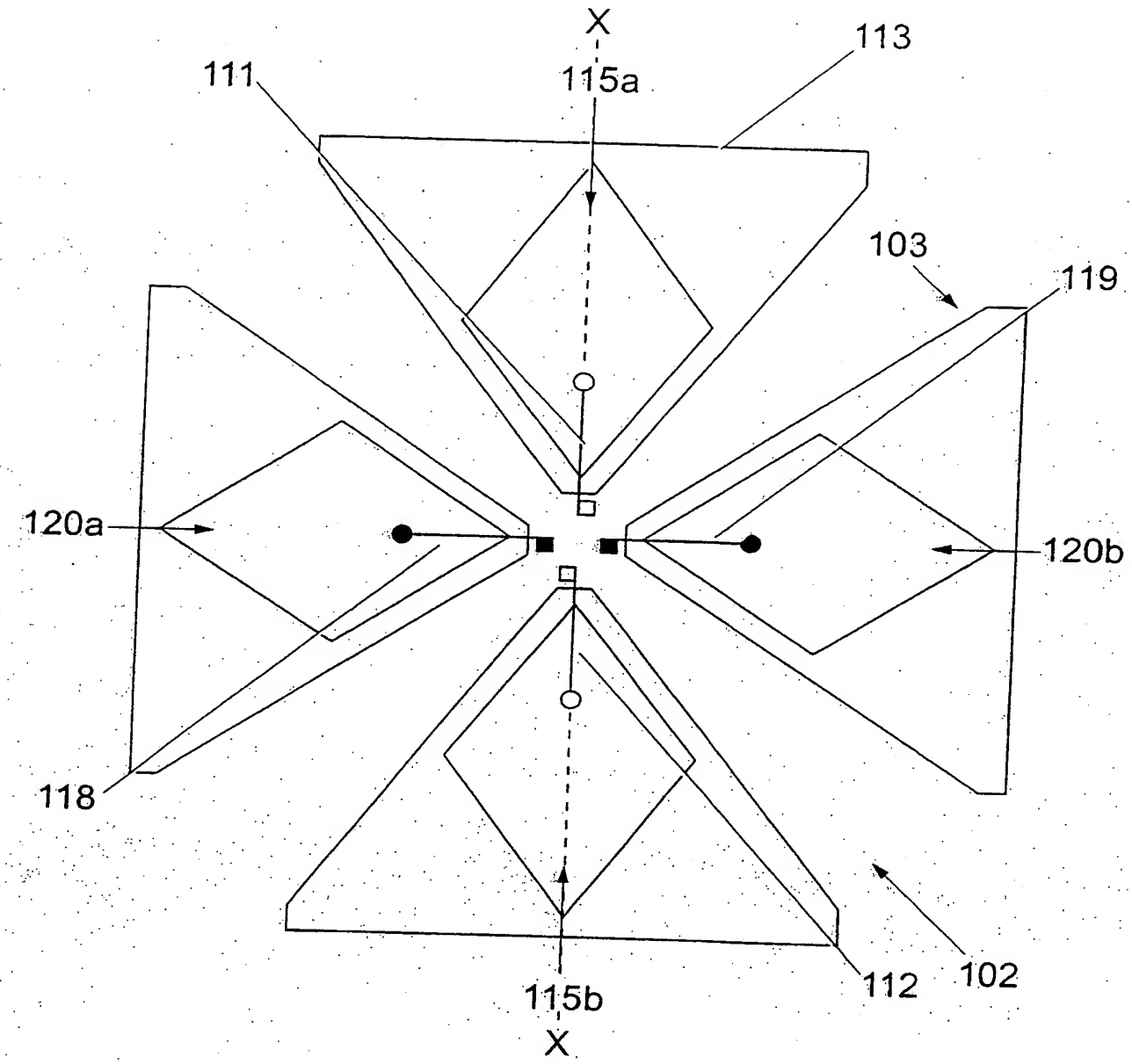



Fig. 4

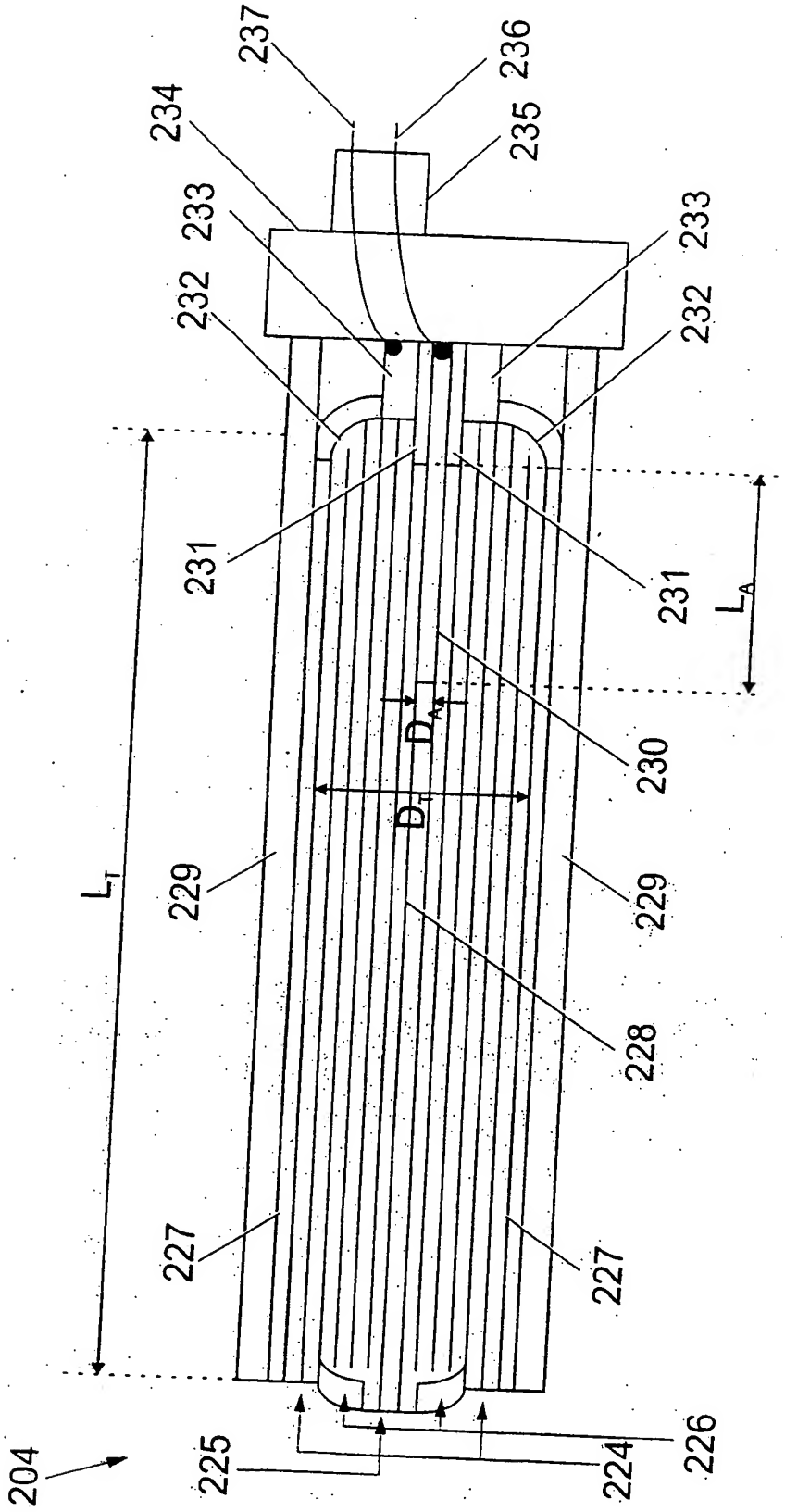

237
236
234
235
233
233
232
232
231
231
$L_A$
230
$D_{A_1}$
$D_T$
$L_T$
229
229
228
227
227
204
225
224
226

Fig. 5A

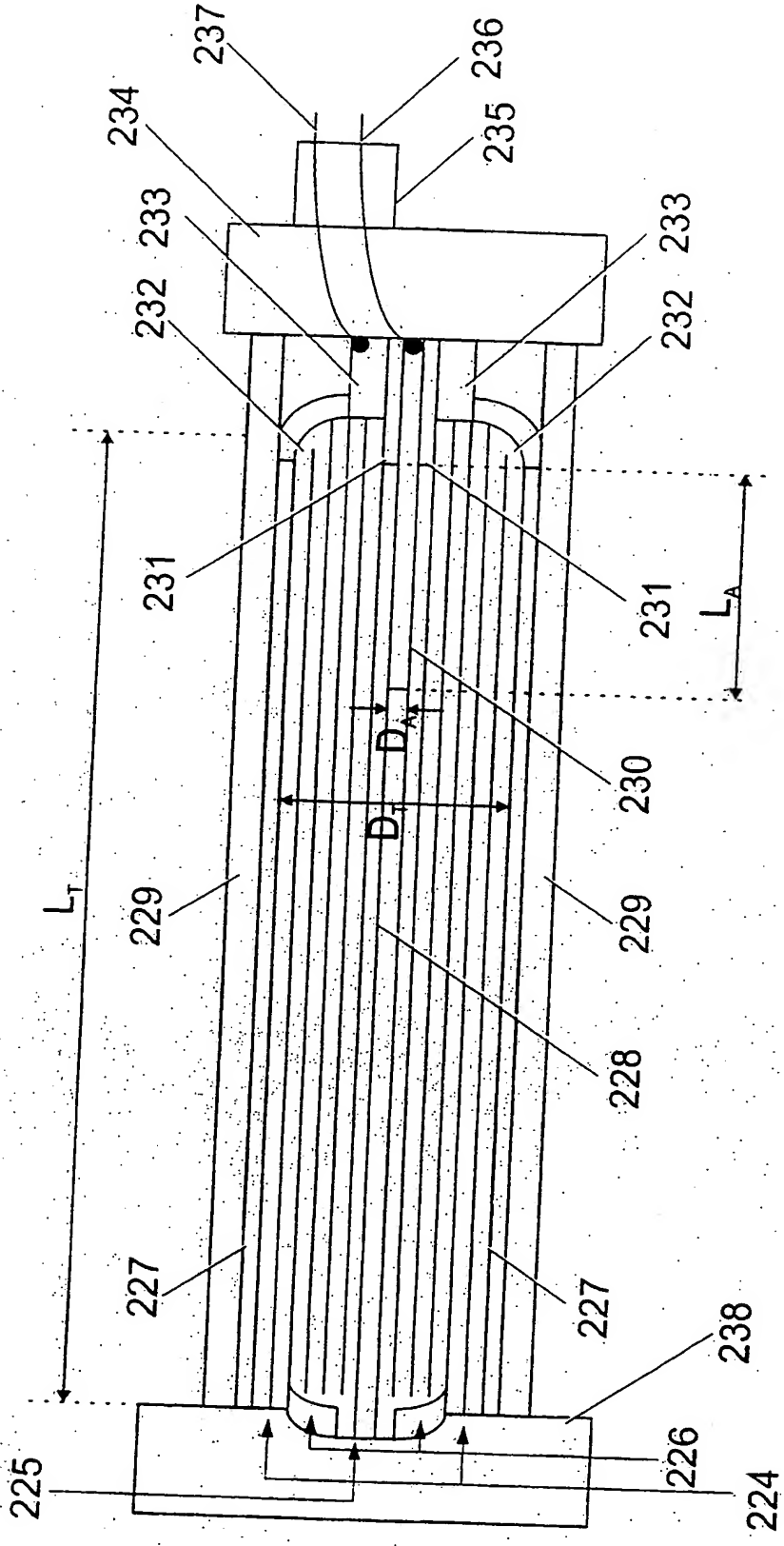

237
236
234
235
233
233
232
232
231
231
$L_A$
$D_A$
$D_T$
230
$L_T$
229
229
228
227
227
238
226
225
224

Fig. 5B

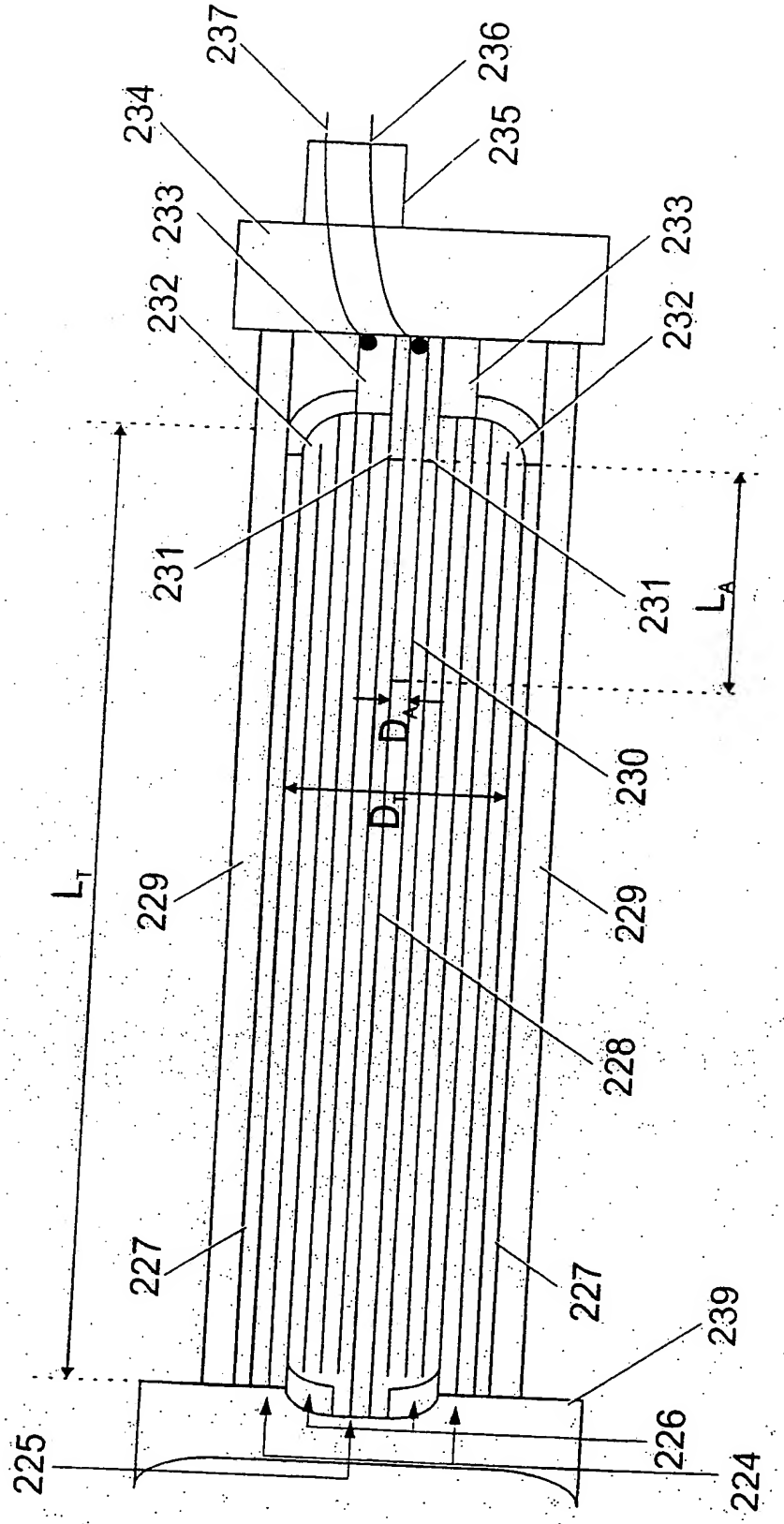

237
236
234
235
233
233
232
232
231
231
$L_A$
$D_A$
$D_T$
230
$L_T$
229
229
228
227
227
239
226
225
224

Fig. 5C

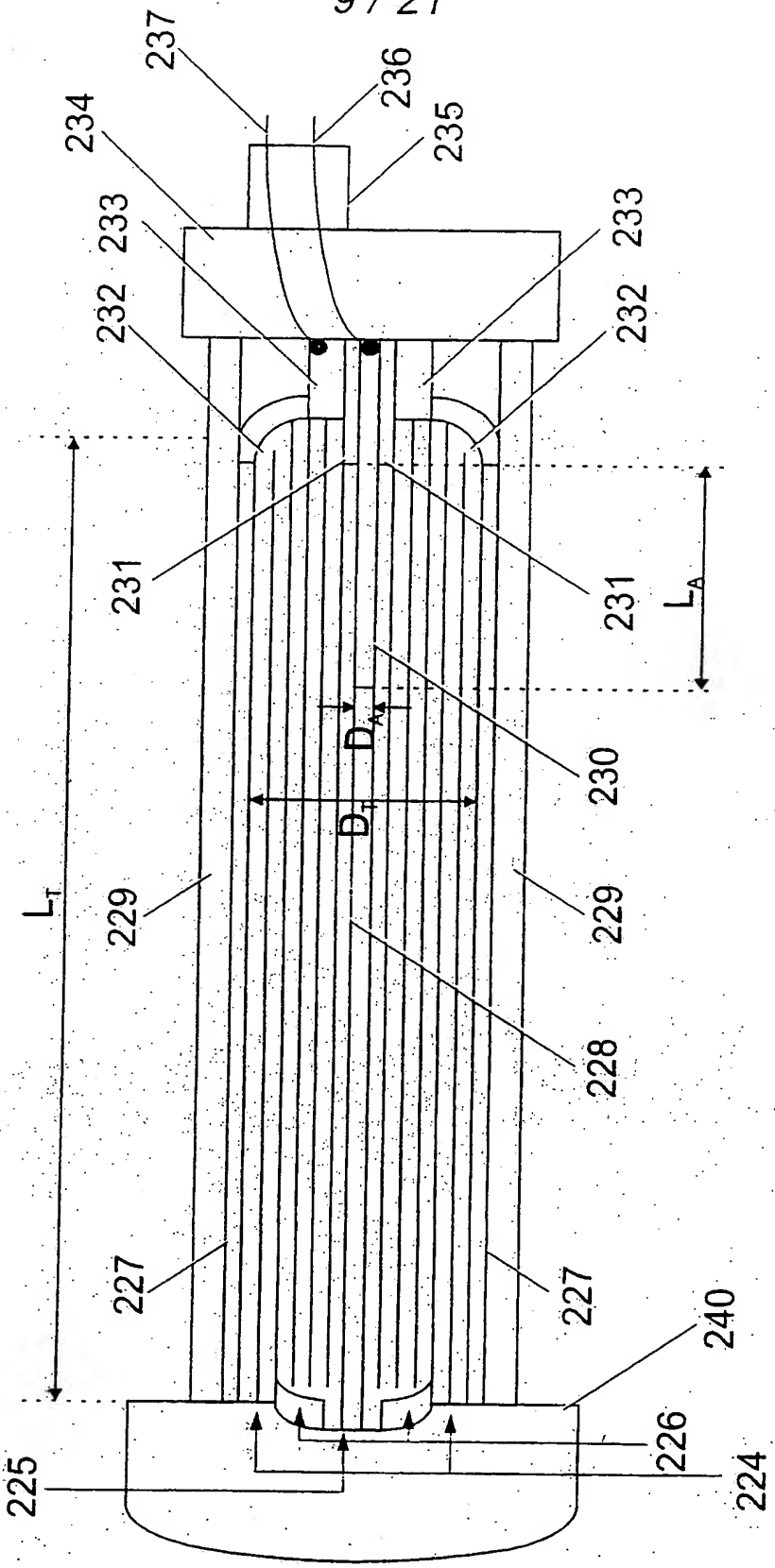

237
236
235
234
233
233
232
232
231
231
$L_A$
$D_A$
$D_T$
230
$L_T$
229
229
228
227
227
240
226
225
224

Fig. 5D

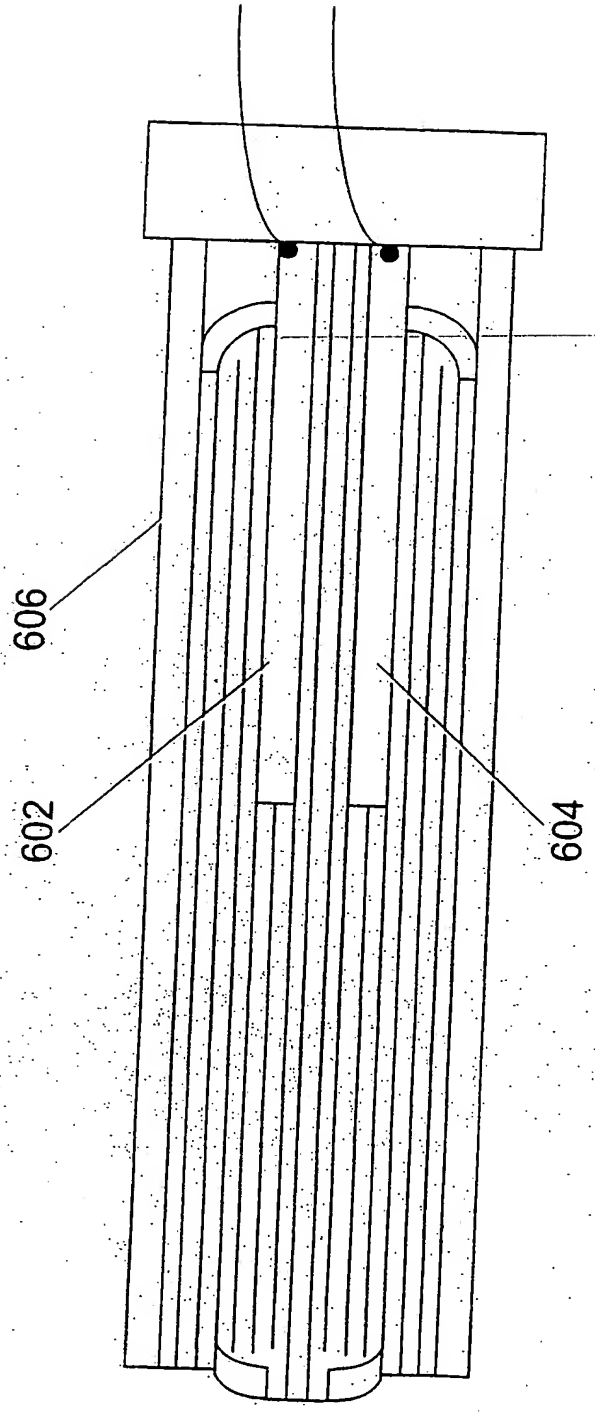



Fig. 5E

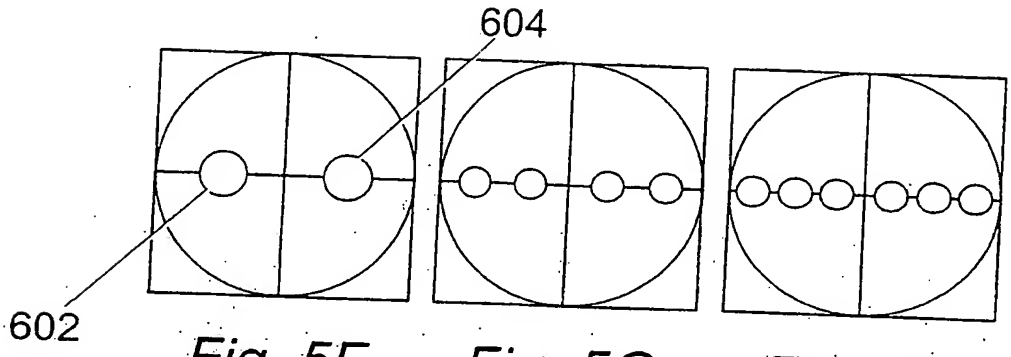



Fig. 5F Fig. 5G Fig. 5H

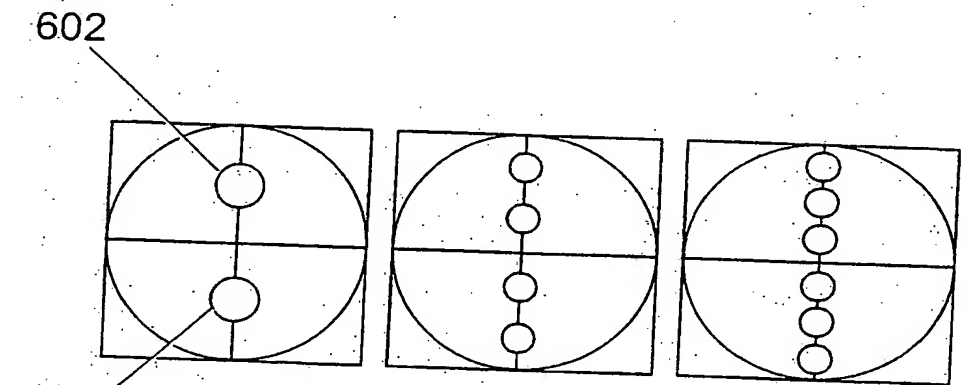



Fig. 5I Fig. 5J Fig. 5K

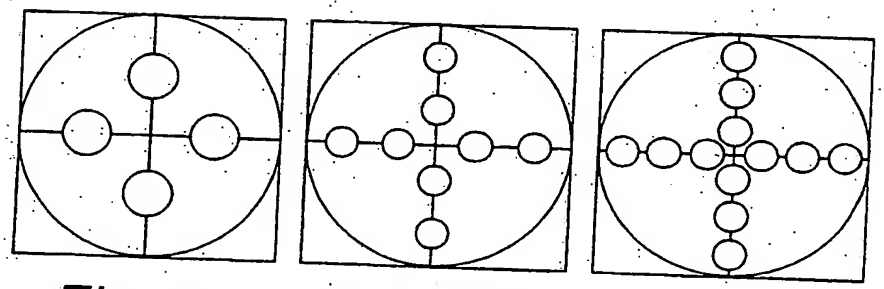


Fig. 5L Fig. 5M Fig. 5N

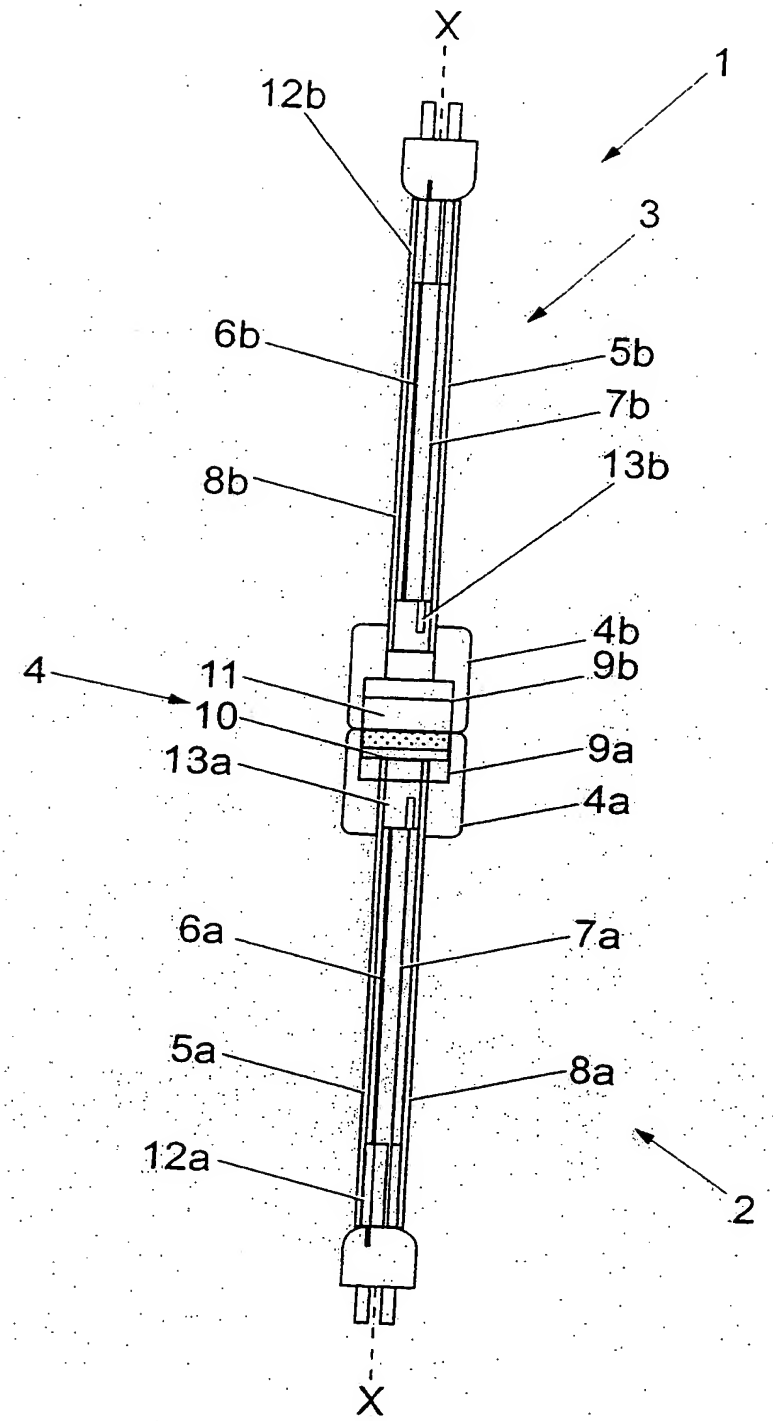



Fig. 6A

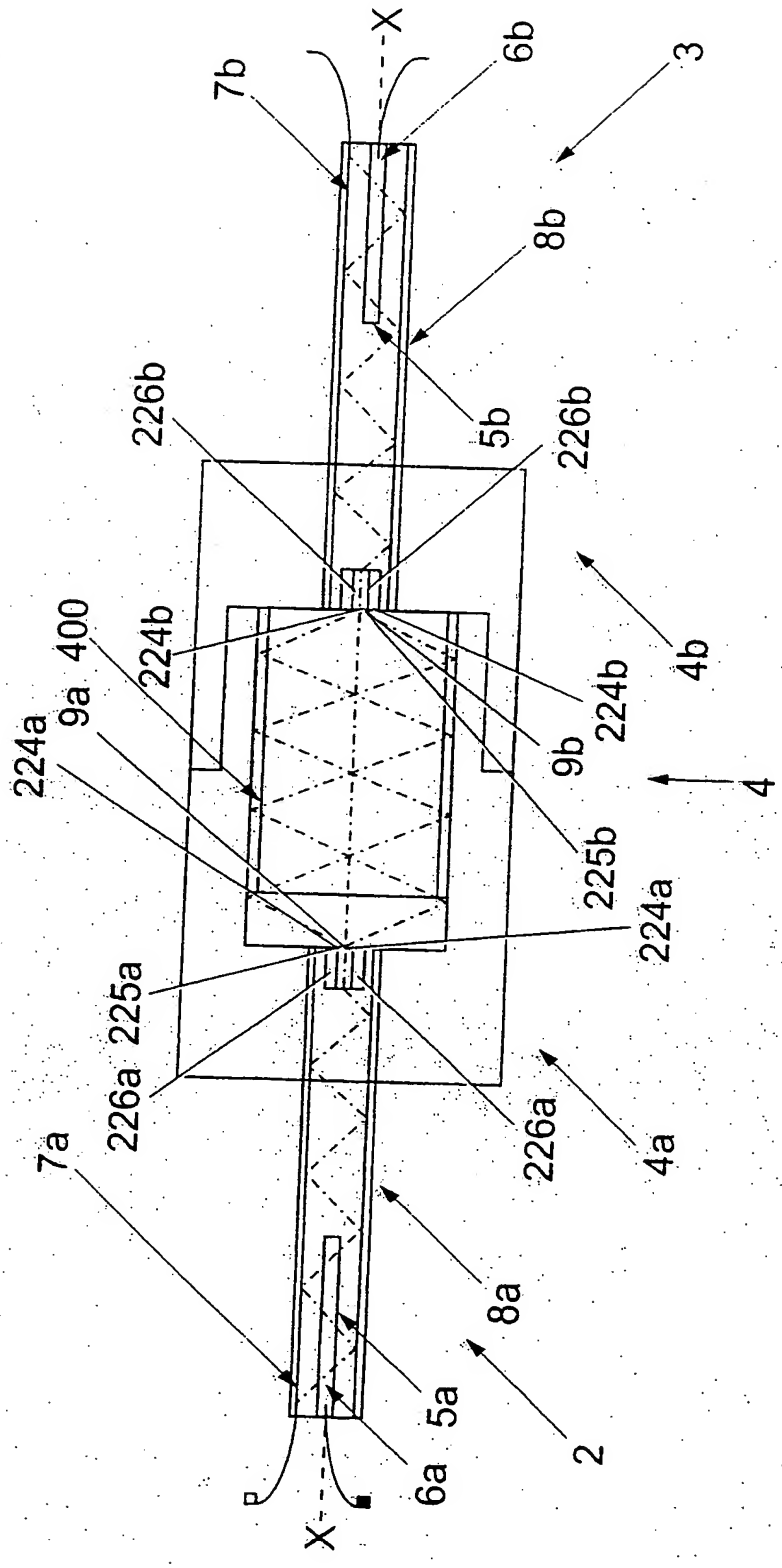

X
7b
6b
3
8b
5b
226b
226b
224b
400
9a
224a
4b
224b
9b
4
225b
224a
225a
226a
226a
4a
7a
8a
5a
2
6a
X

Fig. 6B

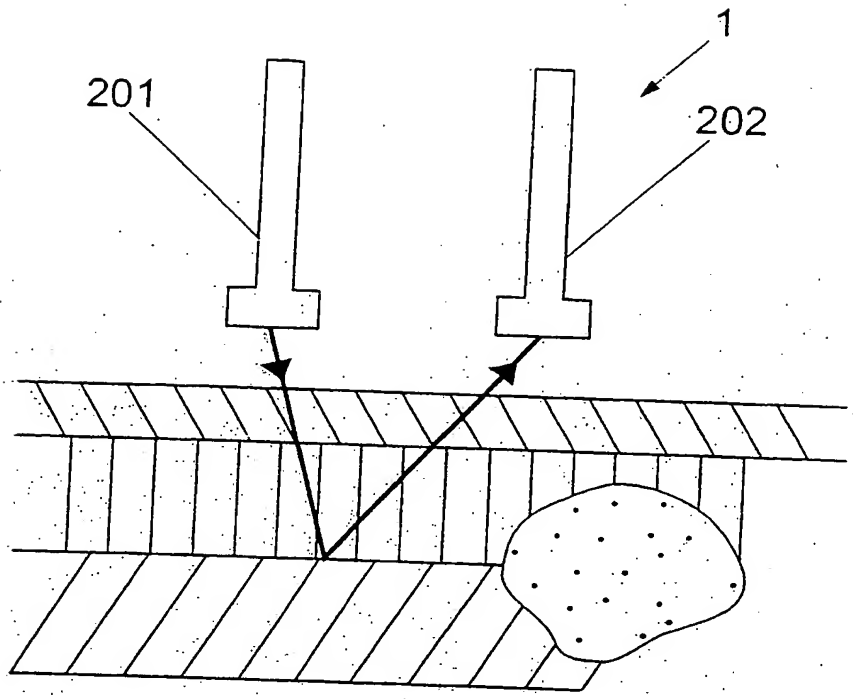



Fig. 7A

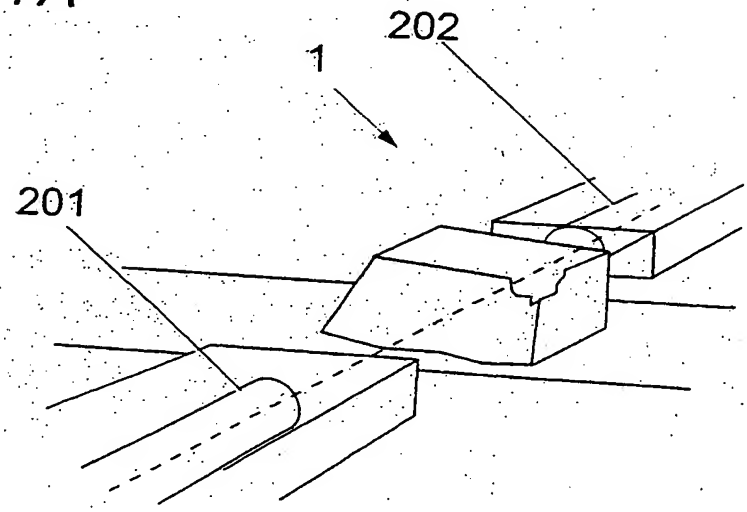
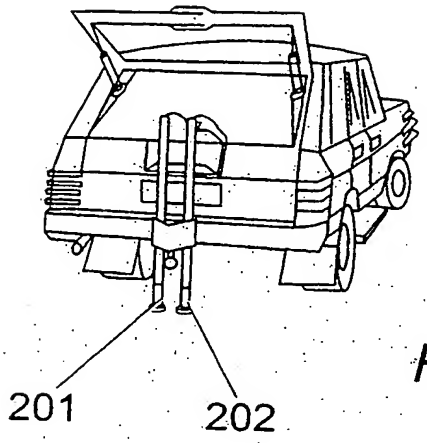



Fig. 7B



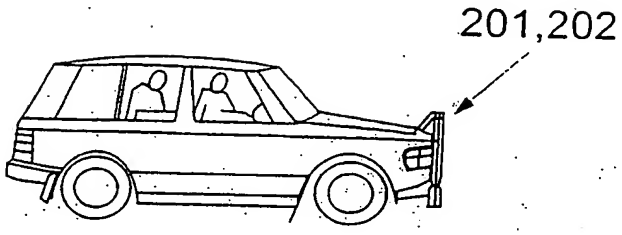
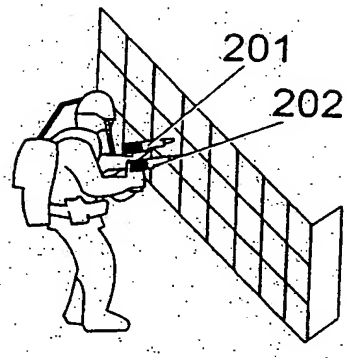




Fig. 8A



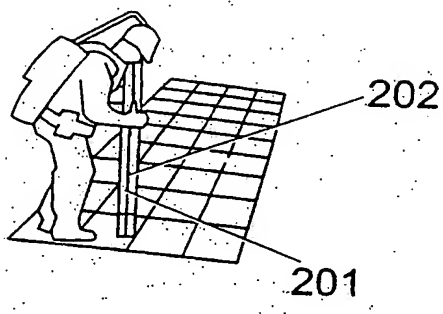




Fig. 8B

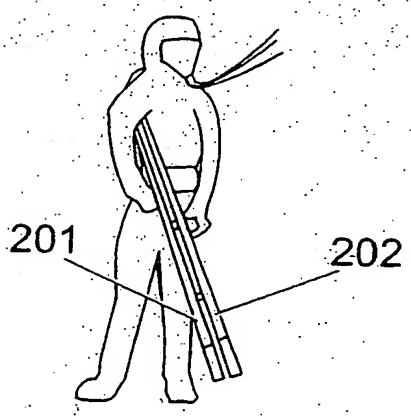



Fig. 8C

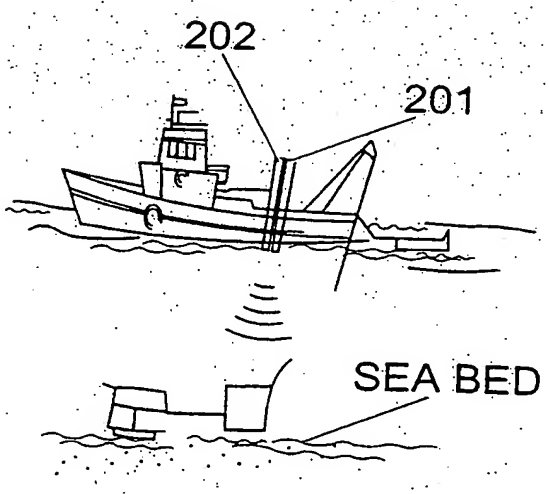



Fig. 8D

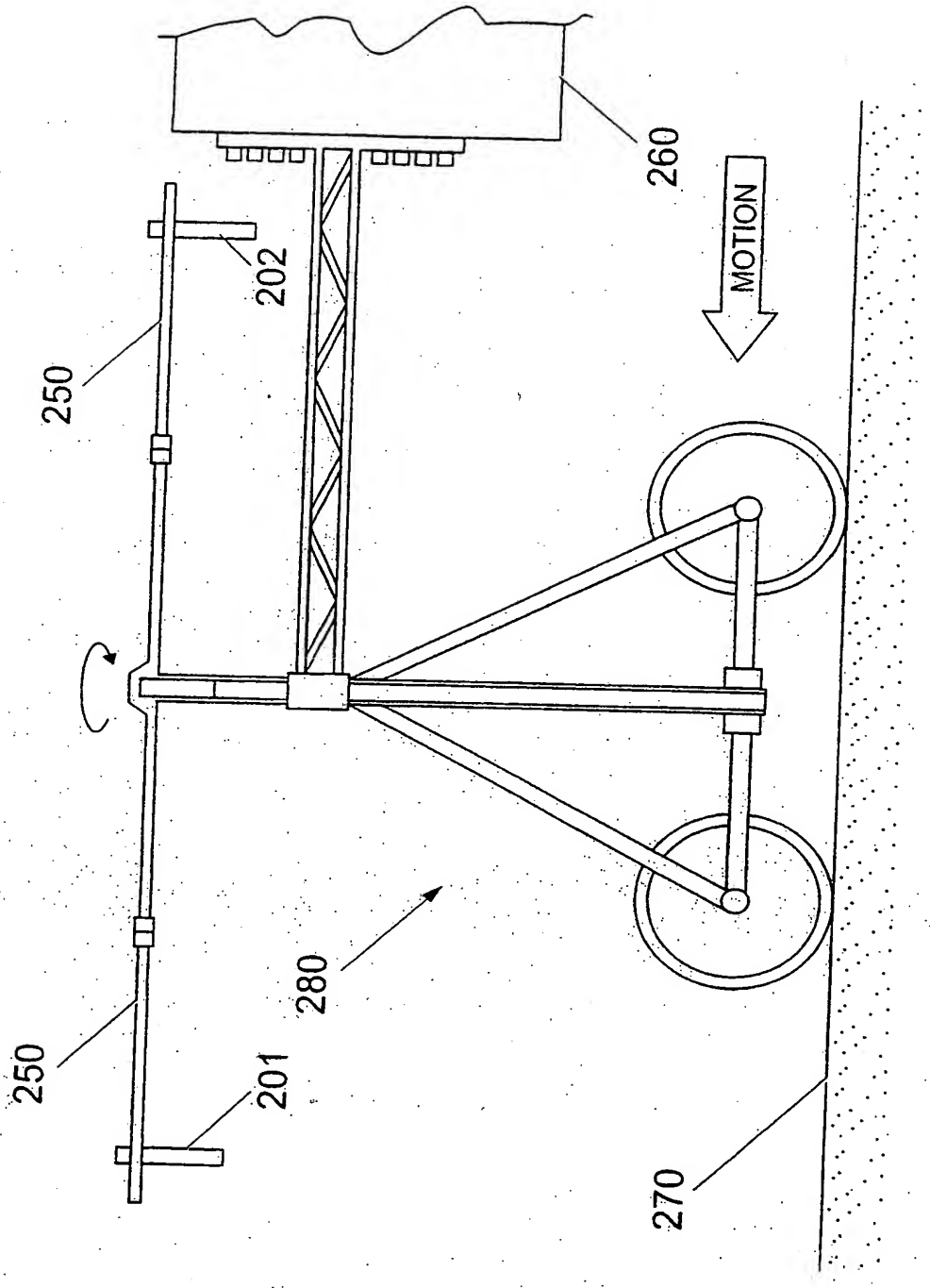



Fig. 9

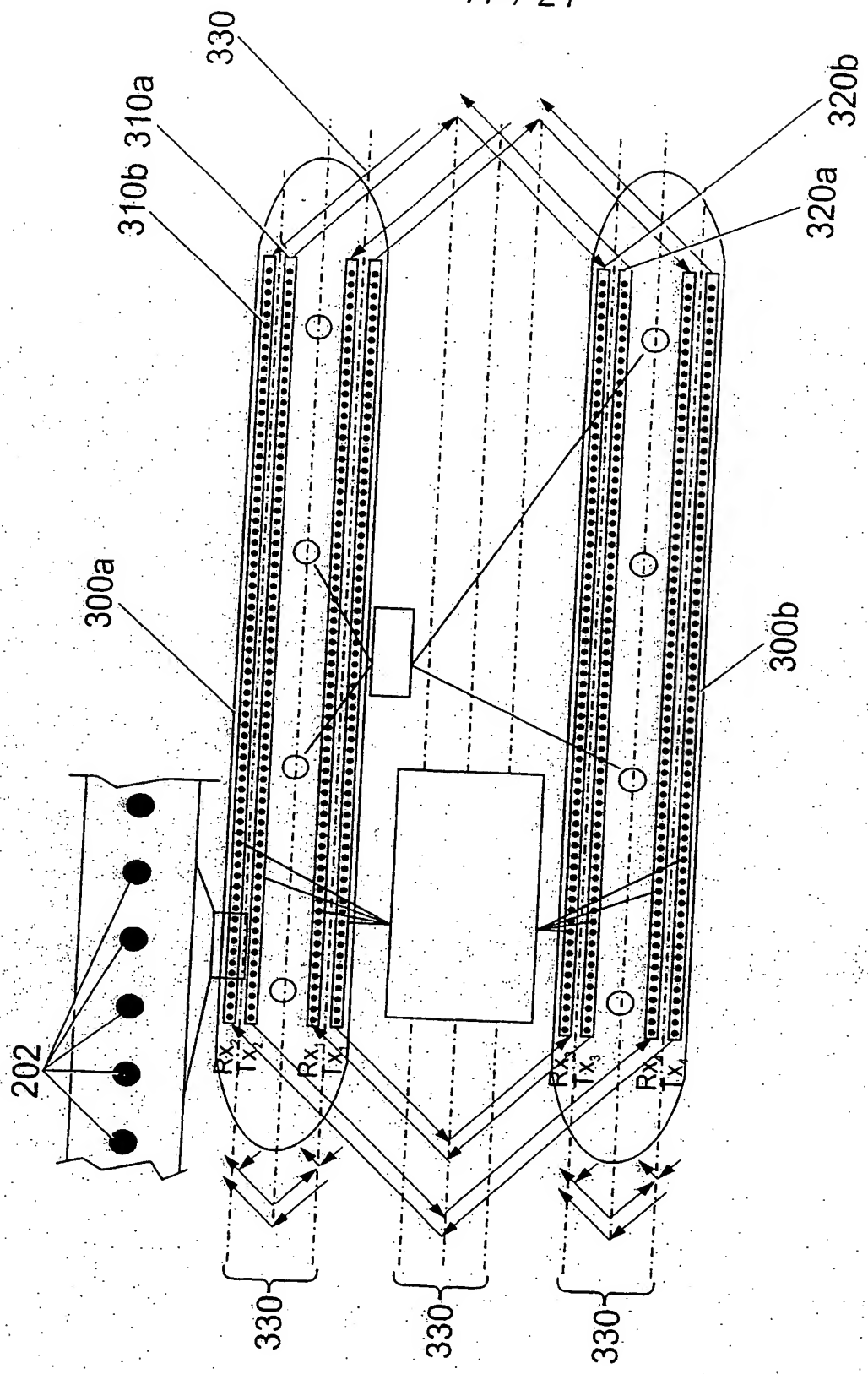

330
310a
310b
320b
320a
300a
300b
202
330
330
330
Rx2
Tx2
Rx1
Tx1
Rx3
Tx3
Rx4
Tx4

Fig. 10

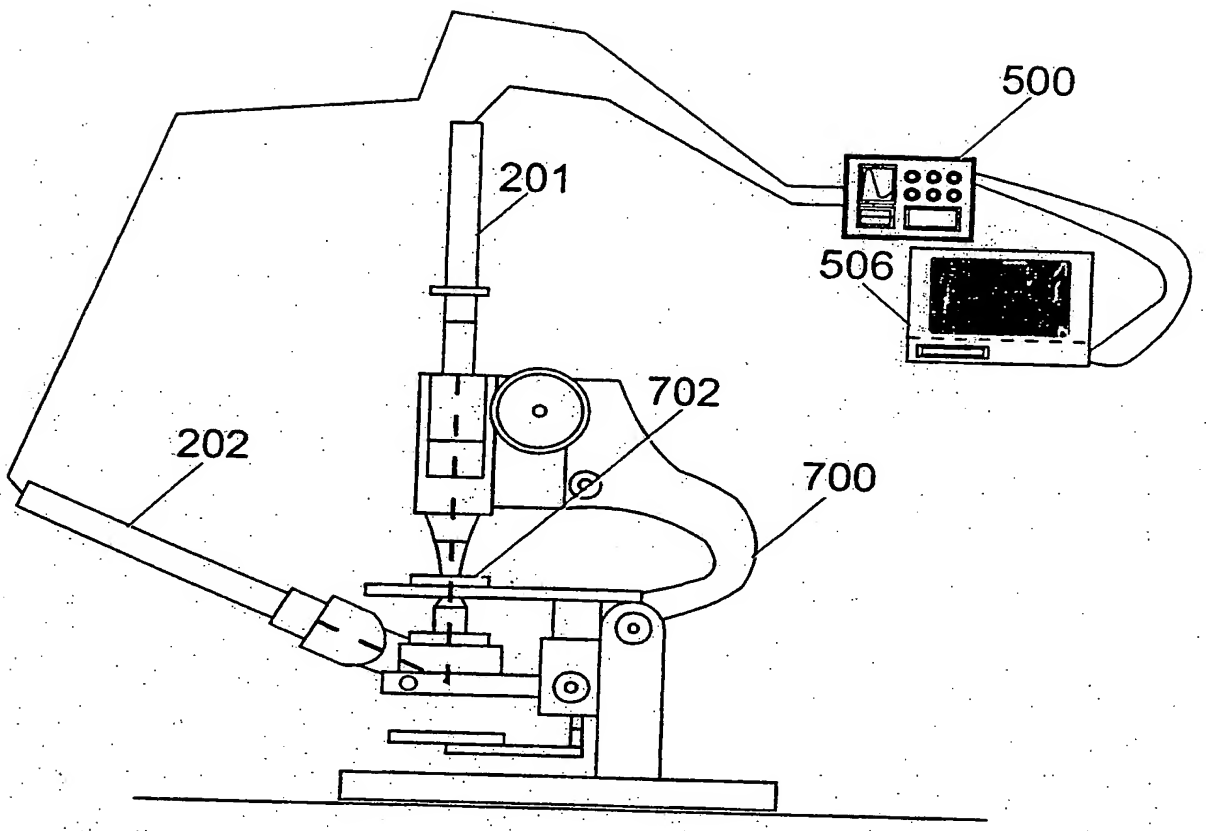



Fig. 11A

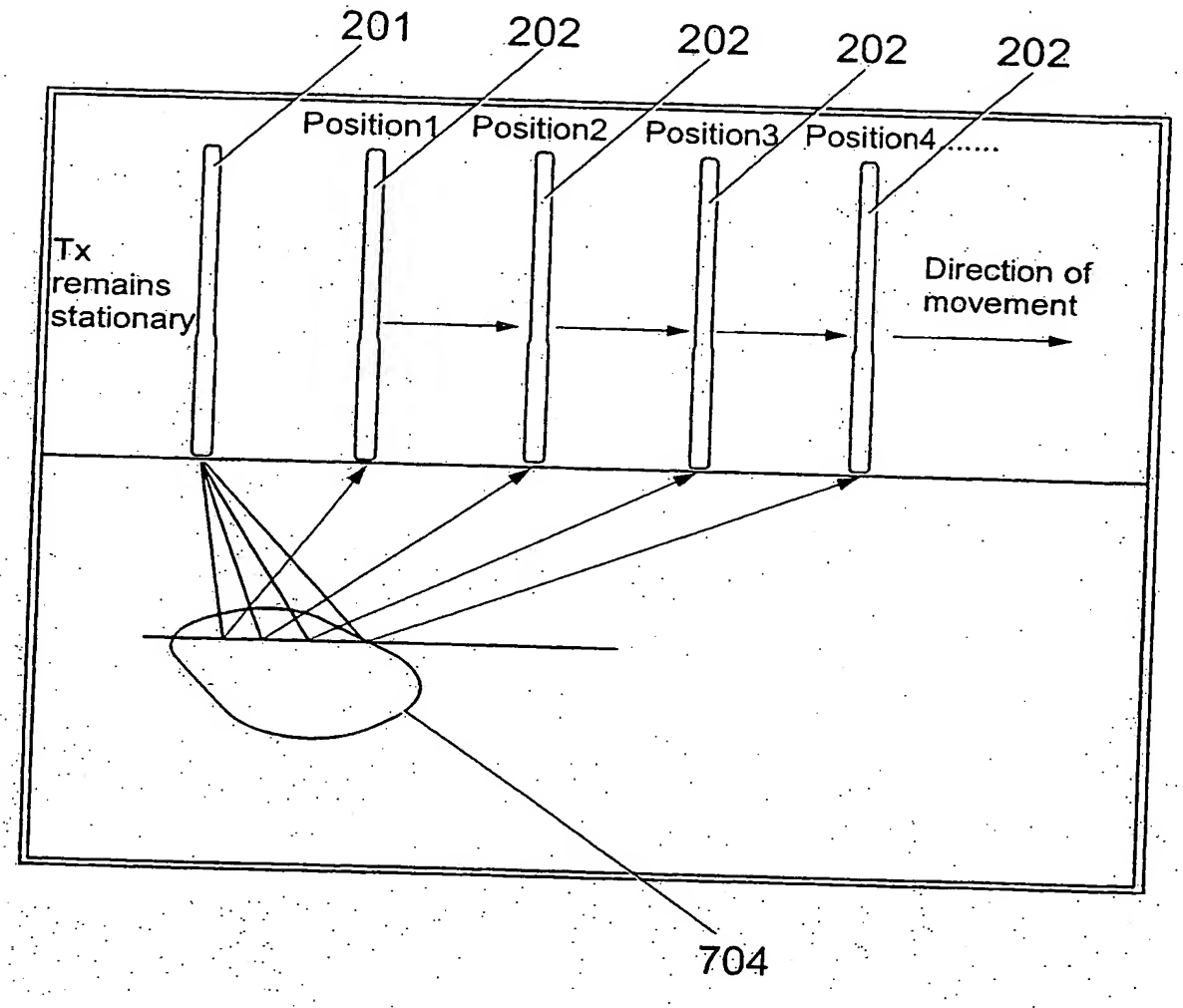

201
202
202
202
202
Position1
Position2
Position3
Position4.....
Tx
remains
stationary
Direction of
movement
704

Fig. 11B

| MODE | Resolution Time (ps) | Resolution Space (m) (in salt water) | PRF (kHz) | Pw (ns) | TR (ns) | Fmax (MHz) | Fmin (MHz) | Ptr | ScanRate (traces/s) | 1/SR (Sdelay) | Ts (ns) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| A1 | 50 | 0.00167 | 100 | 0.1 | 2 | 10000 | 1000 | 40 | 2500 | 0.0004 | 0.05 |
| A2 | 50 | 0.00167 | 100 | 0.1 | 5 | 10000 | 1000 | 100 | 1000 | 0.001 | 0.05 |
| A3 | 100 | 0.00167 | 100 | 0.1 | 10 | 5000 | 500 | 100 | 1000 | 0.001 | 0.1 |
| A4 | 250 | 0.00167 | 100 | 0.1 | 15 | 2000 | 200 | 60 | 1667 | 0.0006 | 0.25 |
| A5 | 500 | 0.00167 | 100 | 0.1 | 25 | 1000 | 100 | 50 | 2000 | 0.0005 | 0.5 |
| B1 | 250 | 0.01667 | 100 | 1 | 2000 | 2000 | 125 | 8000 | 12.5 | 0.08 | 0.25 |
| B2 | 500 | 0.01667 | 100 | 1 | 4000 | 1000 | 62.5 | 8000 | 12.5 | 0.08 | 0.5 |
| B3 | 625 | 0.01667 | 100 | 1 | 6000 | 800 | 50 | 9600 | 10.4 | 0.096 | 0.625 |
| B4 | 1250 | 0.01667 | 50 | 1 | 8000 | 400 | 25 | 6400 | 7.8125 | 0.128 | 1.25 |
| B5 | 2500 | 0.01667 | 25 | 1 | 10000 | 200 | 12.5 | 4000 | 6.25 | 0.16 | 2.5 |
| C1 | 2500 | 0.16667 | 50 | 10 | 20000 | 200 | 12.5 | 8000 | 0.625 | 1.6 | 2.5 |
| C2 | 5000 | 0.16667 | 25 | 10 | 40000 | 100 | 6.25 | 8000 | 0.3125 | 3.2 | 5 |
| C3 | 10000 | 0.16667 | 12.5 | 10 | 80000 | 50 | 2.25 | 8000 | 0.15625 | 6.4 | 10 |
| C4 | 40000 | 0.16667 | 6.25 | 10 | 160000 | 12.5 | 1 | 4000 | 0.15625 | 6.4 | 10 |
| C5 | 62500 | 0.16667 | 3.125 | 10 | 250000 | 12.5 | 1 | 4000 | 0.078125 | 12.8 | 40 |

Sampling Rate=Fs=2*Fmax
Range for all generic types=1/4Fmax-4 Fmax
Ptr=Time Range(TR)/Sampling Time (ts)
Sampling Time=Ts=1/2Fmax, time occupied
by 1 pixel in the y-direction going down the trace

*Fig. 12*

Ptr = number of pixels per trace
PRF = Pulse Repetition Frequency
Pw = Pulse Width
TR = Time Range
Fmax = Maximum Frequency
Fmin = Minimum Frequency
Resolution Time = time between pixels going down the trace
SR = Sampling Rate

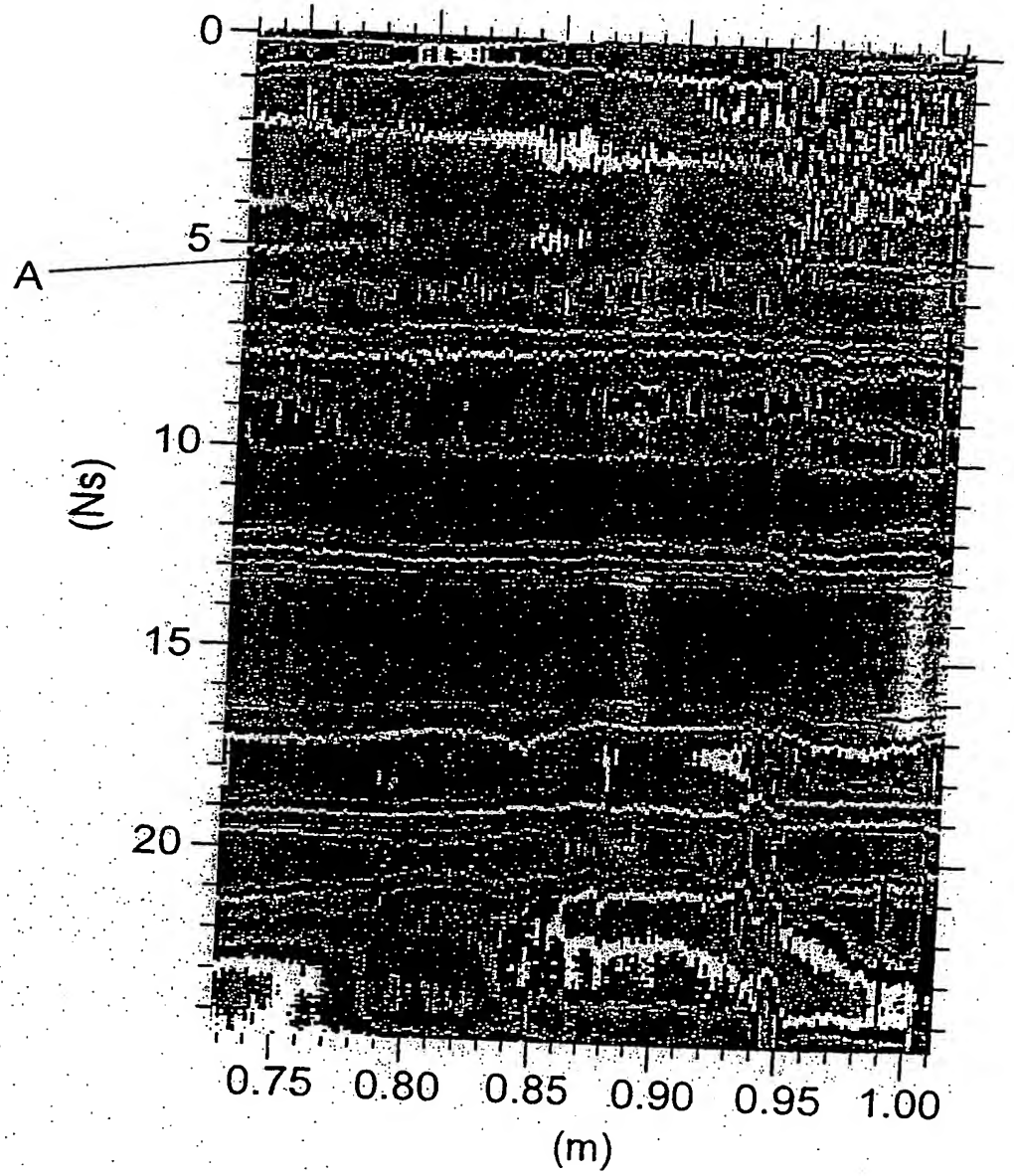



Fig. 13